Watt Road Environmental Laboratory Initiative (WRELI)

Background

Little is known about the in-use, real-world emissions of heavy trucks, yet they are estimated to contribute prominently in the oxides of nitrogen (NOx) and particulate matter (PM) pollution for all highway vehicles. Emissions of mobile source air toxics is an even greater unknown.

The U.S. Department of Energy's (DOE) Watt Road Environmental Laboratory (WREL), a comprehensive outdoor laboratory devoted to the study of in-use heavy-duty vehicle emissions, provides an excellent test bed for researching these and other air quality issues. The WREL sits within one of the busiest truck traffic corridors in the Eastern United States and provides an ideal site for remote emissions sensing of the mixed on-road fleet. The remote sensing can be used to assess the numbers of high emitters within a fleet, as well as the overall emissions from highway vehicles. The WREL also possesses attributes which permit study of "hotspot" NOx and PM levels. Additionally, the highest air toxics exposures also occur at "hot spots" which can overwhelm, in magnitude and exposure, the typical ambient air exposure to air toxics. Understanding mobile source "hot spots" and duration of exposure is critical.

Watt Road interchange on I-40/75 experiences 27,000 heavy trucks daily

Benefits

- Capturing information on real world, in-use heavy truck emissions
- Developing new sensors and techniques for remote interrogation of emissions
- Illuminating ambient air quality issues related to light- and heavy-duty mobile sources
- Learning the beneficial impact of truck idle reduction strategies

The WREL field includes several truck stop facilities and in a recent study, researchers found that levels of air toxics such as formaldehyde and acetaldehyde were several times higher in the ambient air than in urban air. Such widespread fleet data complements the individual truck emissions testing undertaken in the other DOE research projects.

The Technology

The Watt Road Environmental Laboratory Initiative (WRELI) is a joint program between the Oak Ridge National Laboratory (ORNL) and The University of Tennessee to establish a premier field laboratory devoted to 1) the study of real world, in-use emissions from heavy trucks, 2) the study of emissions reduction technologies, 3) the development of specialized instrumentation for remote sensing and characterization of heavy truck emissions, and 4) understanding the interactions between vehicle emissions and ambient air quality.

An important aspect in realizing the objectives of WRELI, is the development of robust and accurate measurement technologies for NOx, PM and other pollutants from mobile sources in the open field setting. Optical based methods are being pursued and demonstrate excellent potential for achieving the rigorous requirements of the application. These include laser distance and ranging (LIDAR) for particle concentration measurements, and differential ultraviolet (UV) absorption for NOx. Acoustical strategies are being investigated to augment vehicle operational information [for example, speed, engine revolutions per minute (RPM), turbocharger RPM, and so forth].

Commercialization

The opportunities for commercializing technology from this effort rest primarily with the novel emissions measurement techniques and instruments being developed. These optically based technologies are well-suited for field deployment in certain conditions, and show promise for achieving accuracy targets under non-intrusive monitoring constraints.

Where Can I Find More Information?

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